



## Project-Based Learning With TikTok: A Digital Strategy for OHS Regulatory Training

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### Abstract

This study examines the pedagogical integration of TikTok within a Project-Based Learning (PBL) framework to enhance the teaching and internalization of Occupational Health and Safety (OHS) regulations in higher education, specifically Executive Decree 255. The primary aim was to evaluate the effectiveness of student-created TikTok videos in fostering active learning, regulatory comprehension, and the development of key academic and professional competencies. Seventy-three undergraduate students from the Practicum III course in the OHS program at Universidad Técnica Particular de Loja participated in the initiative. The structured methodology comprised five phases: topic assignment, digital training, guided video production, public dissemination, and multidimensional evaluation. Student outcomes were assessed through rubric-based evaluation, TikTok engagement analytics, and a validated satisfaction questionnaire addressing eight pedagogical constructs (Cronbach's  $\alpha=0.989$ ; KMO=0.934). Results indicate enhanced conceptual understanding, increased motivation, and the strengthening of transversal competencies such as digital communication and learner autonomy. The novelty of this approach lies in the purposeful use of a widely adopted social media platform as both a pedagogical tool and a dissemination medium, offering a replicable model for other STEM disciplines that require the translation of complex regulatory or technical content into engaging and accessible formats.

### Keywords:

Project-Based Learning;  
Occupational Health and Safety;  
TikTok in Education.

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## 1- Introduction

Higher education continues to face significant challenges in adapting pedagogical approaches to the rapid evolution of digital technologies and the shifting expectations of contemporary learners [1, 2]. The proliferation of information and communication technologies (ICTs), accelerated by global events such as the COVID-19 pandemic, has profoundly transformed traditional educational paradigms [3, 4]. ICTs are no longer seen merely as communication tools but have become integral to the design of dynamic, flexible, and student-centered learning ecosystems, commonly referred to as virtual learning environments [5, 6]. The abrupt transition to remote and hybrid instruction during the pandemic exposed the limitations of conventional lecture-based teaching models [7, 8], emphasizing the urgent need for instructional strategies that foster active participation, cognitive engagement, and meaningful knowledge construction [9, 10].

Although blended and online formats have increased access and flexibility, recent studies (2022-2024) consistently highlight persistent deficiencies in student motivation, engagement, and the transfer of knowledge to real-world applications, especially in content-intensive and technical disciplines [11–13]. As a result, educators are increasingly turning to pedagogical frameworks such as active learning and project-based learning (PBL), often complemented by emerging digital technologies, to better align with the learning preferences, digital fluency, and communication styles

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of today's students [14–16]. Within this context, identifying and implementing digital strategies that are both pedagogically sound and contextually relevant has become a priority for post-pandemic educational reform. Among active learning approaches, PBL has gained widespread recognition in higher education [17]. By positioning students as problem solvers engaged in authentic tasks, PBL fosters the development of critical thinking, creativity, collaboration, and autonomy [18]. A closely related approach, challenge-based learning, enhances motivation by linking academic content to real-world professional and societal issues [19]. In the domain of occupational health and safety (OHS) education, PBL has proven particularly effective in engaging students through applied scenarios, such as analysing and communicating safety regulations [20, 21]. However, few studies have explored the application of PBL to the teaching of complex regulatory frameworks. This gap limits the understanding of how active methodologies can be adapted to traditionally compliance-driven subjects, where legal abstraction and procedural complexity often hinder learner engagement and knowledge retention.

Meanwhile, the integration of digital platforms, particularly social media, has reshaped how students access, interpret, and create academic content [1, 22]. Platforms such as YouTube, Instagram, and especially TikTok offer new opportunities for microlearning, digital storytelling, and peer-to-peer interaction [23]. TikTok, in particular, has emerged as a powerful educational tool due to its short-form, visually engaging, and user-friendly format, qualities that resonate strongly with contemporary learners [24–27]. Its interactive video structure enables students to reinterpret complex technical or regulatory information into accessible and engaging narratives, thereby improving comprehension, motivation, and retention [28–30]. In applied fields such as industrial safety, these audiovisual formats can be especially useful for illustrating the implementation of prevention protocols and legal compliance procedures [31]. In response to these pedagogical and technological challenges, this study introduces an innovative educational model that integrates TikTok within a PBL framework to teach the content of Executive Decree 255, an essential regulatory document in Ecuador's OHS legislation. Students enrolled in an OHS program were tasked with creating short, informative TikTok videos that communicated key aspects of the decree. This initiative was designed not only to improve students' understanding and contextualization of regulatory content but also to cultivate essential professional competencies such as critical thinking, creativity, and digital communication.

The present research addresses a notable gap in the literature by providing empirical evidence on the pedagogical utility of TikTok for regulatory instruction in higher education. It explores the cognitive and motivational impacts of integrating social media into competency-based learning environments and demonstrates how active learning can bridge the gap between abstract legislative content and real-world application. The pedagogical approach is grounded in both constructivist and experiential learning theories, which emphasize knowledge construction through active participation, contextualization, and reflective practice [32–35]. The content creation process inherent in TikTok-based assignments facilitates meaningful learning and supports the development of applied professional skills required in OHS practice. Despite recent reforms, persistent challenges continue to impede the effectiveness of OHS education. These include the technical complexity of legal language, frequent legislative updates, limited opportunities for practical application, and weak links between academic training and industry needs [36–38]. Such issues are further compounded in remote learning environments, where disengagement and abstraction often undermine knowledge transfer [39–41]. According to the International Labour Organization (ILO), nearly three million work-related deaths occur annually, 2.6 million due to illness and 330000 from workplace accidents, representing a 5% increase since 2015 [42]. Many of these incidents stem from inadequate training and risk prevention practices, underscoring the urgency of improving technical education in this domain [43, 44].

Consequently, universities bear a dual responsibility: to ensure compliance with regulatory standards and to instill a preventative mindset in future professionals, equipping them to navigate complex and high-risk work environments [45, 46]. Within this evolving educational landscape, blended learning models that combine synchronous and asynchronous strategies have gained traction. These models prioritize student-centered approaches and leverage digital platforms, including mobile apps, learning management systems, and social media tools, to increase engagement and flexibility [47, 48]. When strategically integrated, TikTok offers unique advantages over other platforms [49, 50]. Unlike YouTube, which typically promotes long-form content, TikTok facilitates microlearning through brief, focused videos tailored to short attention spans [9, 51]. Compared to Instagram, TikTok's editing features and algorithm-driven visibility foster creativity, peer engagement, and user-generated learning experiences [52, 53]. Moreover, its participatory culture and rapid feedback loops make it an ideal platform for informal, student-driven learning, particularly in asynchronous environments [54]. This study contributes to the limited comparative literature by evaluating TikTok's educational potential relative to other digital tools, thereby informing future decisions on platform selection for technical instruction.

This research is guided by the following question: *"Can the creation of TikTok videos effectively support active learning and the internalization of Occupational Health and Safety (OHS) regulations?"* The novelty and value of this work lie at the intersection of active learning, digital content creation, and regulatory education. The pedagogical foundations of this approach are rooted not only in Project-Based Learning but also in broader educational theories. From a constructivist perspective, knowledge is actively constructed by learners through interaction with their environment and reflective engagement with experience [55, 56]. The integration of TikTok supports this process by

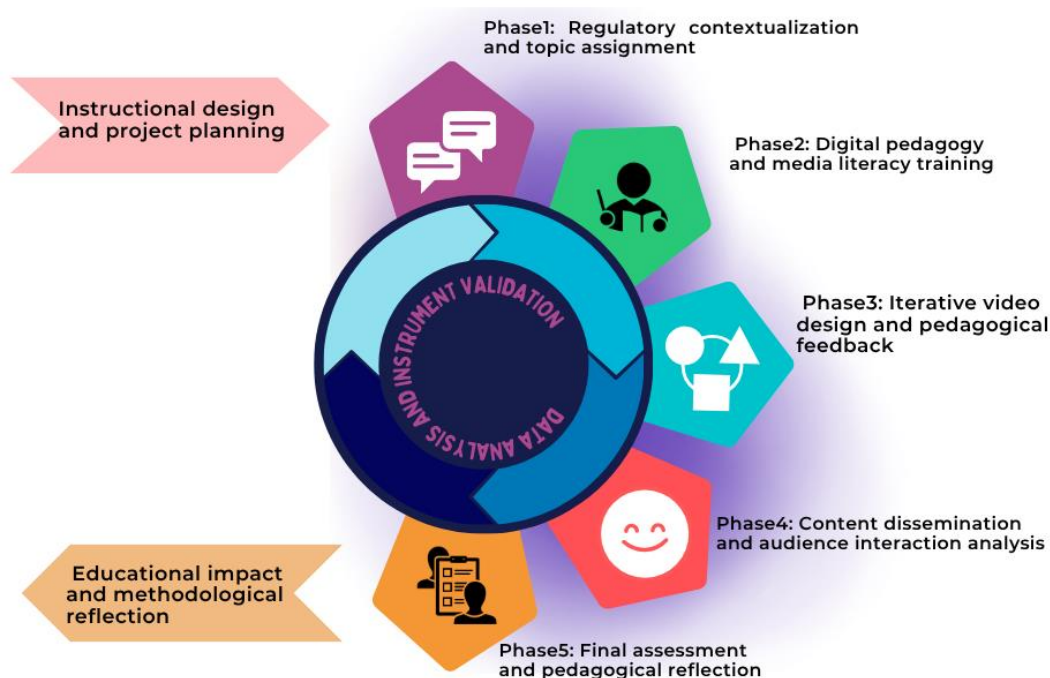
requiring students to transform technical content into meaningful digital narratives. In addition, social learning theory emphasizes the role of observation, imitation, and modelling in the acquisition of knowledge [57, 58]. TikTok's open and collaborative platform fosters peer learning, feedback, and engagement through the sharing of user-generated video content, aligning closely with these theoretical principles [23]. This framework offers a strong conceptual basis for the integration of TikTok into formal OHS education, as it has occurred with other scientific fields [59, 60]. Ultimately, the proposed model presents a scalable and replicable strategy for integrating social media platforms into project-based learning environments, particularly in technical disciplines that require not only knowledge acquisition but also the development of practical competencies and a strong safety culture.

To support a clear understanding of the study's structure, it is organized as follows: the Materials and Methods section outlines the methodological design and implementation of the TikTok-based PBL initiative, along with the instruments and procedures used to assess student engagement and learning outcomes. The Results and Discussion section presents and interprets the empirical findings in relation to existing literature and educational theory. Finally, the Conclusion section summarizes the study's main contributions, practical implications, and avenues for future research in OHS education.

## 2- Material and Methods

### 2-1- Study Design and Planning Framework

This study adopted a methodology aligned with pedagogical objectives and institutional curriculum requirements. Figure 1 presents a visual summary of the methodological workflow. This sequential structure aligns with key pedagogical goals that support the development of student competencies in Occupational Health and Safety (OHS) education.



**Figure 1. Workflow of the Project-Based Learning Methodology Integrating TikTok for OHS Education**

The project was carefully aligned with the official academic calendar to ensure that all instructional responsibilities were carried out within the assigned faculty teaching load. The pedagogical structure, including the definition of the project timeline, instructional activities, evaluation strategies, and technological resources, was developed collaboratively by the university's Research Group on Innovation and Prototyping of Advanced and Pharmaceutical Materials, in close coordination with the course faculty. This joint effort ensured both didactic coherence and curricular alignment.

Before the project's implementation, participating faculty received formal training through a pedagogical development course offered by the university's Directorate of Faculty Development. This training focused on instructional strategies for integrating video-based learning into the curriculum and included an overview of digital tools and editing software. While several tools were introduced, not all were utilized in the present study.

This study employed a Project-Based Learning (PBL) methodology to enhance student engagement and promote applied learning within the field of Occupational Health and Safety (OHS), focusing specifically on the interpretation

and communication of Executive Decree 255. A structured, competency-based instructional model was designed to bridge theoretical content with practical application, enabling students to critically analyse and creatively convey regulatory knowledge using digital platforms. Two complementary planning frameworks guided the project's design and execution: (i) a Project-Based Learning planning framework, which provided the foundation for an interactive and student-centered learning environment, and (ii) a Structured PBL framework based on the Business Model Canvas (BMC) [61], which guided the integration of legal content with real-world applications. Together, these frameworks supported the contextualization of legal content through real-world applications. These frameworks jointly established clear learning objectives, pedagogical strategies, and assessment instruments, fostering critical thinking, digital communication, and regulatory literacy throughout the project cycle.

The Structured PBL planning matrix, presented in Table 1, served as the core pedagogical support for this study. It ensured a systematic, competency-driven learning experience centered on the dissemination of Occupational Health and Safety (OHS) regulations through TikTok. This framework explicitly defined learning outcomes, instructional methodologies, and evaluation criteria, guiding students through an experiential learning process. Students progressed from regulatory analysis to the conceptualization, scripting, and production of digital educational content, thereby developing skills in critical interpretation, audiovisual storytelling, and professional communication within the OHS domain.

**Table 1. Project-Based Learning planning framework: designing an interactive learning experience for OHS education**

Step 1. Define learning Outcomes <i>Learning targets</i>	Step 2. Refine the driving Question <i>Driving Question (DQ)</i>	Step 3. Plan the culminating event <i>Student presentation</i>	Step 4. Define calendar and milestones <i>Project timeline</i>
<ul style="list-style-type: none"> <li>- Enable students to analyse, interpret, and understand the core components of Executive Decree 255 and its implications for occupational health and safety.</li> <li>- Guide students in the creation of educational TikTok content that is both pedagogically effective and engaging.</li> <li>- Develop students' communications competencies by producing digital content aimed at socializing OHS regulations with industry stakeholders and the general public.</li> </ul> <p><i>Expected outcomes</i></p> <ul style="list-style-type: none"> <li>- Students will be able to clearly explain the regulation's significance and practical application within industrial contexts.</li> <li>- Students will demonstrate proficiency in digital communication, teamwork, and problem-solving.</li> <li>- Students will critically evaluate the effectiveness of their TikTok videos in promoting awareness of regulatory compliance.</li> </ul>	<ul style="list-style-type: none"> <li>- Can the creation of TikTok videos effectively support active learning and the internalization of Occupational Health and Safety (OHS) regulations?</li> </ul> <p><i>Project deliverable</i></p> <ul style="list-style-type: none"> <li>- Production of informative and engaging TikTok videos that accurately convey essential aspects of Executive Decree 255.</li> <li>- Content tailored for accessibility and relevance to both industrial and professional and the general public.</li> </ul> <p><i>Project purpose</i></p> <ul style="list-style-type: none"> <li>- To reinforce student understanding of OHS regulations through experiential learning and digital storytelling. The project encourages the application of content creation skills to support knowledge dissemination, regulatory interpretation, and communication efficacy.</li> </ul>	<ul style="list-style-type: none"> <li>- Final videos are uploaded to a centralized TikTok project account, ensuring equitable access and visibility.</li> <li>- Videos are disseminated publicly, allowing students to observe engagement metrics as indicators of outreach.</li> </ul> <p><i>Assessment strategy</i></p> <ul style="list-style-type: none"> <li>- Videos are evaluated using technical and pedagogical rubrics, assessing clarity, content accuracy, creativity, and audience engagement.</li> <li>- Assessment integrates formative components (peer review, instructor feedback) with summative elements (final evaluations and competency-based grading).</li> </ul>	<p>Phase 1 (Weeks 1–4): Introduction to Executive Decree 255 and individual topic assignments. Guided research on regulatory implications.</p> <p>Phase 2 (Weeks 5–7): Training in digital storytelling, video editing, and scriptwriting. Submission of scripts and storyboards for instructor feedback.</p> <p>Phase 3 (Weeks 8–13): Iterative video development with structured feedback and revision cycles.</p> <p>Phase 4 (Weeks 14–15): Final video production and publication. Engagement metrics collected.</p> <p>Phase 5 (Week 16): Final evaluation of learning outcomes through instructor assessment and a post-project student satisfaction survey.</p>
Step 5. Plan scaffolding and assessments <i>Scaffolding strategies</i>	Step 6. Launch entry event <i>Introductory activities</i>	Step 7. Adopt productive group work <i>Collaboration systems and tools</i>	
<ul style="list-style-type: none"> <li>- Regulatory content instruction to establish foundational understanding.</li> <li>- Access to curated resources, including legal documents, tutorials, and workshops.</li> <li>- Structured guidelines for organizing video content to ensure clarity and educational value.</li> <li>- Showcasing exemplary student projects to inspire creativity and set expectations.</li> </ul> <p><i>Assessment approach</i></p> <ul style="list-style-type: none"> <li>- Formative: iterative feedback on scripts, drafts, and prototypes.</li> <li>- Summative: final videos assessed via a rubric covering content accuracy, audiovisual creativity, audience impact, and production quality.</li> </ul> <p><i>Video evaluation criteria</i></p> <ul style="list-style-type: none"> <li>- Engagement indicators such as views, likes, shares, and comments analysed to assess reach and public reception.</li> </ul>	<ul style="list-style-type: none"> <li>- A virtual opening session introduced the project and promoted discussion of expected challenges.</li> <li>- Students upload completed videos to the project account.</li> <li>- A structured self-assessment encouraged reflection on learning and digital creation process.</li> </ul>	<ul style="list-style-type: none"> <li>- Utilization of institutional LMS platforms (e.g., Canvas) for coordination, feedback, and milestone tracking.</li> <li>- TikTok and video editing software employed for the development of virtually engaging educational content.</li> </ul> <p><i>Assigned student roles</i></p> <ul style="list-style-type: none"> <li>- Researchers: identified and synthesized relevant legal information.</li> <li>- Scriptwriters: drafted concise and informative video narratives.</li> <li>- Video editors: manage audiovisual production and post-processing.</li> <li>- Content coordinators oversaw final uploads and monitored platform engagement metrics.</li> </ul> <p>All student roles were integrated into a shared publishing strategy that promoted collaborative accountability while ensuring individual contributions were visible and valued.</p>	
<i>Student satisfaction and competency assessment</i>			
<ul style="list-style-type: none"> <li>- Post-project survey gauged student satisfaction and perceived development in communication, problem-solving, and digital media skills.</li> </ul>			

The learning activity began with the problem identification and research phase, during which students examined Executive Decree 255 by deconstructing its principal components and identifying regulatory compliance challenges within industrial contexts. To assess their baseline knowledge and anticipate difficulties in interpreting legal frameworks, a diagnostic assessment was administered. This instrument enabled instructors to adapt instructional strategies based on students' initial understanding. Through guided research and collaborative discussions, learners developed a shared conceptualization of the regulation's purpose and implications, laying the foundation for subsequent content development.

In the design and development phase, students were tasked with transforming complex legal language into clear, engaging, and accessible educational content. This process not only deepened their regulatory comprehension but also fostered their ability to communicate technical concepts effectively to diverse audiences. To facilitate structured collaboration, students assumed specialized roles, including:

- Regulatory analysts, who ensured the legal accuracy of the information conveyed;
- Content developers, who organized and scripted the material to maximize clarity and engagement;
- Media production specialists, who managed the creation, editing, and optimization of videos for the TikTok platform.

These defined roles promoted the development of analytical, communicative, and technical competencies. The project followed an iterative refinement process, allowing students to progressively enhance both the content quality and visual appeal of their videos. In the implementation and dissemination phase, students published their final videos to TikTok and analysed user engagement metrics (e.g., views, comments, shares). These interactions served as feedback mechanisms, offering insight into the effectiveness of their communication strategies and the broader outreach of the regulatory messaging.

The final phase, assessment and reflection, allowed students to evaluate their learning outcomes, assess the educational impact of their videos, and identify areas for improvement. This structured reflection supported self-directed learning and contributed to the development of professional skills essential for effective workplace communication. Although the project did not involve direct industry engagement, the Project-Based Learning methodology ensured that students acquired both applied regulatory knowledge and essential transversal skills, such as digital literacy, critical thinking, and multimedia content creation.

To enrich the pedagogical model, the Structured planning framework using the Business Model Canvas (BMC) for PBL [62] (Table 2) was incorporated as a strategic complement. While the Project-Based Learning framework (Table 1) guided the instructional process, the BMC framework offered a broader strategic lens, encouraging students to consider the long-term sustainability and societal relevance of their outputs. This framework enabled students to:

- Identify their target audience, including industry professionals and the general public;
- Define their value proposition, ensuring their content clarified and contextualized regulatory requirements;
- Select appropriate communication channels, using TikTok to enhance visibility, interaction, and dissemination.

By integrating pedagogical and strategic planning tools, this dual-framework model provided a comprehensive educational experience. Students were empowered not only to internalize OHS regulations but also to develop critical digital communication skills, engage in content creation, and reflect on the societal implications of their work. This approach ensured that learners were equipped with both theoretical foundations and practical tools, preparing them for real-world challenges in their future professional contexts.

The BMC framework served as a strategic complement to the project's pedagogical foundation. Beyond organizing the content development process, it encouraged students to reflect on the broader implications of their work. Although the immediate aim was to enhance learning outcomes, the framework introduced the concept of sustainability and potential scalability of digital educational tools. Students were guided to consider how their videos could extend beyond classroom requirements to serve as impactful instruments for raising awareness about OHS legislation within real-world industrial settings. Moreover, the BMC framework supported a constructivist learning environment, where students actively constructed knowledge by relating legal content to real-life scenarios and communicating their interpretations through creative digital narratives. It also reflected principles of social learning theory by promoting shared experiences, observational learning, and feedback loops through public video dissemination. This dual pedagogical-strategic approach helped reinforce not only the acquisition of regulatory knowledge but also the development of critical soft skills such as teamwork, self-reflection, and problem-solving. By integrating the PBL framework (Table 1) with the BMC framework (Table 2), the project fostered a comprehensive, competency-based learning experience. Students developed regulatory expertise, enhanced digital fluency, and explored the social relevance of their educational content, positioning them to become active contributors to workplace safety culture and regulatory compliance in their future professional roles.



**Table 2. Structured planning framework using the Business Model Canvas (BMC) for Project-Based Learning (PBL) in occupational health and safety education**

Challenges	Proposed solutions	Known/Understandable	Unknown/Understandable
<b>Academic challenges in OHS education:</b> The teaching of occupational health and safety (OHS) legislation often presents persistent difficulties, including complex legal language, limited practical contextualization, frequent legislative updates, low student motivation, and weak connections to industry practice.	<b>Adoption of innovative methodologies:</b> The integration of project-based learning (PBL) strategies and digital platforms such as TikTok aims to create dynamic, engaging, and contextually relevant educational experiences.	Content and relevance of Ecuadorian OHS regulations.	Specific challenges faced by industries in interpreting and complying with Executive Decree 255.
<b>Workplace dissemination gaps:</b> Many industries remain unaware of Executive Decree 255, which introduced updated OHS requirements in Ecuador.	<b>Digital communication strategy:</b> The development and dissemination of educational videos on TikTok support students in understanding, interpreting, and sharing regulatory content, while simultaneously raising awareness among both professional and general audiences.		
Conventional approaches	Resources needed	Known/Incomprehensible	Unknown/Incomprehensible
<b>Traditional teaching practices:</b> - Lectures - Printed materials - Seminars and workshops	Access to legal documents Video editing software TikTok platform	Basic video production techniques for educational purposes.	Student perception and the pedagogical effectiveness of TikTok as a regulatory learning tool.
Curriculum content for project development	Key competencies required		
<b>Project conceptualization and development:</b> Identifying socially relevant OHS challenges and understanding the importance of compliance with safety regulations in workplace settings.	- Ability to critically analyse and interpret occupational health and safety regulations for educational dissemination. - Proficiency in digital communication, including video production and online engagement.		
<b>Regulatory framework analysis:</b> Reviewing and interpreting Ecuadorian OHS legislation, specifically Executive Decree 255, to translate its content into accessible educational material (e.g., video scripts for TikTok).	- Media literacy and technical skills to produce clear, engaging, and informative content tailored to diverse audiences.		

## 2-2- Project Description

This study was conducted during the April–August 2024 academic term within the course Practicum III – Community Service, which aimed to provide students with an experiential learning opportunity by integrating Project-Based Learning (PBL) with digital content creation. A total of seventy-three undergraduate students enrolled in the Occupational Health and Safety (OHS) program at the Faculty of Exact and Natural Sciences, Universidad Técnica Particular de Loja (UTPL), participated in the initiative.

Delivered entirely through a virtual learning environment, the course required each student to work individually on a specific OHS-related topic. This format accommodated participants from various geographical locations and ensured a broad exploration of the regulatory content outlined in Executive Decree 255.

The primary objective of the project was to strengthen students' understanding of OHS regulations by engaging them in the interpretation, summarization, and creative communication of key regulatory concepts. Rather than relying on passive content consumption, students were challenged to produce short, pedagogically oriented TikTok videos that were both educational and accessible to wider audiences. The videos were designed to:

- Emphasize the significance of the regulation and its contribution to workplace safety.
- Clearly explain the application of specific provisions in real-world occupational contexts.
- Illustrate how regulatory compliance prevents workplace incidents and promotes safety standards.
- Be concise (maximum 60 seconds) while maintaining clarity and conceptual depth.
- Use digital storytelling strategies to simplify complex regulatory language and enhance engagement.

### 2-2-1- Platform Selection

The decision to use TikTok as the primary platform for this educational activity was based on prior exploratory work conducted by the research group. In a recently published study involving a similar cohort of undergraduate students, TikTok was identified as a preferred platform for creating and disseminating technical academic content [23]. Compared to other platforms such as YouTube or Instagram, students rated TikTok as more intuitive and engaging, particularly when tasked with explaining scientific concepts or demonstrating real-life applications of disciplinary knowledge.

Students highlighted the platform's mobile accessibility, built-in editing features, and short-form video format as elements that supported their creative process while enhancing comprehension. Although no formal comparative survey was conducted specifically for this project, consistent informal feedback gathered during previous academic cycles within the OHS program reinforced TikTok's suitability as a pedagogical tool. These findings informed the strategic integration of TikTok into the present PBL activity, where it served as the central medium for regulatory communication, knowledge dissemination, and digital engagement.

### ***2-3-Project Implementation***

The project was implemented over a 16-week academic term, during which each of the five instructional phases, problem identification, regulation analysis, content planning, video production, and peer feedback, was aligned with the course's weekly progression. All related tasks were fully integrated into the standard instructional workload assigned to faculty members. At UTPL, instructors are allotted two synchronous teaching hours per week per course, which were utilized to support students through scheduled Zoom sessions. In addition, continuous asynchronous support was provided through the institutional learning management system (Canvas), including message responses, assignment evaluations, and the facilitation of discussion forums.

The five instructional phases were structured as follows:

#### **Phase 1: Regulatory contextualization and topic assignment (Weeks 1–4)**

Students were introduced to the project's objectives, methodology, and expected outcomes. This was followed by a preliminary analysis of Executive Decree 255. A diagnostic assessment was administered to gauge students' baseline understanding and identify challenges in interpreting regulatory content. Each student was then assigned a distinct topic within the decree and guided through independent research, supported by structured discussion with the instructor.

#### **Phase 2: Digital pedagogy and media literacy training (Weeks 5–7)**

Students participated in targeted training sessions on digital storytelling and video production. The training covered essential aspects such as scriptwriting, content structuring, editing techniques, and the use of TikTok-specific tools (e.g., effects, transitions, overlays). These sessions combined theoretical instruction with hands-on workshops, enabling students to build confidence and technical proficiency in designing educational content.

#### **Phase 3: Iterative video design and pedagogical feedback (Weeks 8–13)**

Students developed their TikTok videos through an iterative process involving weekly progress reviews, instructor feedback, and structured peer evaluations. To ensure the accuracy of legal content and promote effective communication, students were required to submit a written script and a visual storyboard for instructor review before filming. These materials were critically assessed to verify accurate interpretation of Executive Decree 255 and ensure clarity of the educational message. Evaluation rubrics emphasized regulatory accuracy, coherence, and the pedagogically appropriate use of audiovisual elements. Scaffolding strategies supported the gradual development of learner autonomy, facilitating the transition from instructor-guided production to independent content creation, while fostering analytical, technical, and creative competencies.

#### **Phase 4: Content dissemination and audience interaction analysis (Weeks 14–15)**

Final videos were submitted via a centralized project TikTok account, ensuring equitable visibility and access. While students' outcomes remained the primary objective, digital engagement indicators (e.g., number of views, likes, and comments) were also monitored to assess each video's reach, relevance, and potential for broader knowledge dissemination.

#### **Phase 5: Final assessment and pedagogical reflection (Week 16)**

Instructors evaluated the final videos using rubrics focused on legal content accuracy, narrative clarity, audiovisual quality, and creative execution. Additionally, students completed a post-project satisfaction survey, which assessed their perception of the PBL methodology, the effectiveness of digital content creation for learning regulatory concepts, and perceived improvements in engagement, knowledge retention, and skill acquisition.

### ***2-4-Project Evaluation***

#### ***2-4-1- Assessment of the Project***

A comprehensive evaluation rubric was designed to assess the pedagogical and technical quality of the student-produced TikTok videos (Table 3). This rubric ensured a balanced evaluation of both the accuracy of the regulatory content and the effectiveness of audiovisual communication. The assessment was conducted using a 10-point scale and was structured around five core criteria:

- **Content accuracy (30%):** assesses the clarity and correctness of the regulatory explanation, the inclusion of relevant examples, and the student's presence and confidence in delivering the material.
- **Creativity (20%):** evaluates the originality and effective use of TikTok features (e.g., transitions, effects), as well as the integration of subtitles to enhance accessibility and inclusion.
- **Audiovisual clarity and structural coherence (20%):** focuses on the organization and logical flow of the video, including the presence of a clear introduction, body, and conclusion.
- **Duration (15%):** ensures adherence to the target length (approximately one minute) to balance completeness with viewer attention span.
- **Audience engagement (15%):** uses platform interaction metrics, such as views, likes, shares, and comments, as a proxy for the video's communication effectiveness and reach.

**Table 3. Evaluation rubric for project assessment**

Criterion	Excellent (10-9)	Good (8-7)	Satisfactory (6-5)	Needs Improvement (4-1)
Content accuracy (30%)	Provides a clear, accurate explanation supported by specific examples. The student appears confident and articulate on camera.	Explanation is generally clear but lacks depth or specific examples; minor signs of hesitation may be present.	Explanation is vague and supported by limited or overly general examples. The student appears uncertain.	Explanation is incomplete or unclear; relevant content is minimal, or the student is absent from the video.
Creativity (20%)	Demonstrates a high level of creativity and originality through effective use of TikTok features. Subtitles are well integrated and enhance accessibility.	Shows creativity with moderate use of TikTok tools. Subtitles are present but only partially support accessibility standards.	Demonstrate limited creativity; minimal use of platform tools. Subtitles are basic or poorly aligned with the content.	Lacks creativity; platform tools and subtitles are poorly implemented or absent.
Audiovisual clarity and structural coherence (20%)	The video is well-organized, with a logical flow and a clearly defined introduction, development, and conclusion. The message is coherent and effectively delivered.	Structure is generally clear, though minor issues in organization or coherence may be present.	Basic structure is evident, but some segments are disorganized or confusing.	The video lacks a logical structure, making the content difficult to follow or understand.
Duration (15%)	Duration is between 45 and 60 seconds, maintaining strong viewer engagement.	Duration is between 30-45 or 60-75 seconds; pacing remains mostly effective.	Duration is slightly outside the ideal range (<30 or >75 seconds), slightly reducing engagement.	Duration deviates significantly from recommended limits, negatively affecting communication quality.
Audience engagement (15%)	Strong engagement, evident through a high number of views, likes, comments, and shares.	Moderate engagement is observed across audience interaction metrics.	Limited evidence of audience interaction.	Minimal or no engagement is recorded.

### 2-4-2- Student Satisfaction Questionnaire

To assess students' perceptions of the learning experience facilitated through TikTok, a structured satisfaction questionnaire was administered after the project. This instrument was adapted from a previously validated framework used in educational research [63] and was designed to evaluate student engagement, perceived learning outcomes, and the perceived effectiveness of TikTok as a pedagogical tool. The selection of this questionnaire was based on its alignment with the study's objectives and its relevance to measuring the integration of Project-Based Learning (PBL) and digital content creation within higher education. Given the individual and virtual format of the course, the questionnaire was modified to assess students' competency development in digital media production, regulatory interpretation, and public communication. In contrast to traditional passive instruction, this project emphasized active learning through the creation of educational content. Therefore, the instrument also included items targeting students' self-assessed improvements in digital and communication skills. The final version of the questionnaire comprised eight core constructs:

**1. Active Learning Engagement (ALE):** this construct assessed the extent to which the TikTok creation process enhanced student engagement with the regulatory content.

ALE1: Creating my TikTok video helped me engage more deeply with Executive Decree 255.

ALE2: Researching and structuring my video content improved my understanding of OHS regulations.

ALE3: Developing my own educational video encouraged me to take a more active role in my learning.

**2. Perceived Playfulness (PP):** this section measured the degree to which students found the learning experience enjoyable and stimulating.

PP1: Creating a TikTok video made learning about OHS regulations more interesting.

PP2: I found making a video a fun and creative way to learn.

PP3: I enjoyed using TikTok as a learning tool for this project.

PP4: Overall, working on this TikTok video was a positive and engaging learning experience.



**3. Immersion (IM):** this construct evaluated students' concentration and involvement throughout the learning process.

IM1: While creating my TikTok video, I was fully engaged in the learning process.

IM2: The video creation process kept me focused on understanding Executive Decree 255.

IM3: I was deeply absorbed in my work while editing and refining my video.

IM4: The hands-on nature of this project helped me stay engaged with the material.

**4. Interactivity (IN):** despite the project being conducted individually, this construct measured perceived interaction and support from instructors.

IN1: Although I worked individually, I had opportunities to ask my instructor questions.

IN2: I felt comfortable reaching out for guidance when needed.

IN3: I received useful feedback from my instructor on my video content and structure.

**5. Virtual Reward (VR):** this construct explored the motivational effect of receiving feedback and recognition from both instructors and online audiences.

VR1: Receiving likes, comments, or reactions on my TikTok video motivated me to improve my learning.

VR2: Knowing my video would be shared as part of this educational project encouraged me to put more effort into it.

VR3: Instructor feedback made me feel that my work was meaningful.

**6. Perceived Usefulness of TikTok for Learning (PUTL):** this dimension assessed whether TikTok was perceived as a valuable platform for enhancing understanding and retention of regulatory content.

PUTL1: Creating my TikTok video helped me understand OHS regulations more clearly.

PUTL2: The short-video format helped me retain key regulatory concepts.

PUTL3: Using TikTok for learning showed me that digital media are useful for professional training.

PUTL4: This project demonstrated that social media can be effectively integrated into educational practices.

**7. Perceived Ease of Use (PEU):** this section measured students' perception of the platform's usability for creating educational content.

PEU1: It was easy for me to learn how to create and edit a TikTok video for this project.

PEU2: I found TikTok user-friendly for making educational content.

PEU3: I effectively used TikTok to simplify and present complex regulatory information.

PEU4: I did not experience major technical difficulties using TikTok for this project.

**8. Novelty Experience (NE):** this construct evaluated whether the activity was perceived as a new and unique approach to learning about OHS regulation.

NE1: Creating a TikTok video to learn about Executive Decree 255 was a new experience.

NE2: Using TikTok as a tool for learning and explaining OHS regulations was different from my previous learning experiences.

NE3: The process of creating and structuring a TikTok video for learning was a unique way to engage with academic content.

Descriptive statistical analysis was conducted to summarize responses across all items. In addition, internal consistency was assessed using Cronbach's alpha to validate the reliability of the instrument in capturing students' perceptions. The resulting data provided a comprehensive overview of how students experienced the integration of TikTok into their learning and the extent to which this methodology supported engagement and competency development in occupational health and safety education.

### 3- Results and Discussion

#### 3-1-Participant Profile and Study Context

The study was conducted with undergraduate students enrolled in the Practicum III – Community Service course within the Occupational Health and Safety (OHS) program. The participant sample reflected a balanced gender

distribution, comprising 47.9% women ( $n = 35$ ) and 52.1% men ( $n = 38$ ). This near parity minimizes the risk of gender-based bias and enhances the generalizability of the findings across diverse student populations. Regarding age demographics, a majority of participants (53.4%,  $n = 39$ ) were over 30 years old, indicating a substantial proportion of mature students, many of whom were likely to possess prior academic or professional experience in occupational health, risk management, or related technical fields. The second most represented age group was 24–26 years (28.8%;  $n = 21$ ), followed by students aged 21–23 age group (17.8%;  $n = 13$ ). Notably, no participants were reported in the under-20 or 27–30 age ranges, suggesting a cohort primarily composed of early-career professionals and adult learners pursuing continued education or advanced qualifications.

This demographic composition provides valuable insights into the learning dynamics observed throughout the project. The predominance of mature students may have contributed to higher levels of intrinsic motivation, self-discipline, and reflective engagement. Their existing familiarity with workplace safety practices and regulatory frameworks likely fostered a more analytical and pragmatic approach to the interpretation of Executive Decree 255 and the development of educational content for TikTok dissemination.

Understanding the participants' demographic profile is essential to contextualize the study's outcomes, particularly regarding student engagement, comprehension of legal content, and the efficacy of innovative, technology-enhanced instructional strategies [12]. The diversity in age and gender supports a broader exploration of how learner characteristics intersect with pedagogical design, ultimately shaping both the learning process and the effectiveness of digital educational interventions [22].

### ***3-2- Platform Preference and Comparative Insight***

The results of this study are consistent with recent findings comparing short-form and traditional video platforms in educational contexts. While YouTube Shorts are increasing in popularity, particularly in entertainment domains, they have shown comparatively lower educational value per view within academic content categories [64, 65]. Conversely, TikTok offers greater technological affordances, such as intuitive in-app editing tools, algorithm-driven content dissemination, and user-friendly interfaces, which enhance microlearning opportunities and student engagement more effectively than Instagram Reels and YouTube Shorts [65, 66].

Although YouTube continues to be a preferred platform for delivering comprehensive tutorials and long-form instructional videos, its extended durations may negatively affect learner attention and accessibility, particularly among students with limited time or shorter attention spans [9, 67]. In contrast, TikTok's optimized for mobile device, short-form format, characterized by brevity, visual dynamism, and immediacy, has proven particularly effective for disciplines that require concise explanations and clear communication of complex concepts, such as occupational health and safety (OHS) regulations [66, 68].

Moreover, empirical evidence suggests that TikTok has a greater motivational impact than other platforms. For instance, a recent study conducted in Indonesia with high school students reported a 78% increase in learning motivation and 15–25% improvement in academic performance when TikTok was integrated into instructional activities, outperforming Instagram in similar contexts [66]. These findings underscore TikTok's effectiveness in supporting both engagement and comprehension when tailored to curricular objectives [69, 70].

In this study, TikTok was selected as the primary content creation and dissemination platform based on prior exploratory research, informal feedback from students, and its demonstrated pedagogical advantages [23]. The decision was further supported by the growing body of literature recognizing TikTok's alignment with active learning principles and its utility in competency-based instruction [27, 67]. Thus, the use of TikTok in this project was not only methodologically appropriate but also strategically validated, reinforcing its role as a powerful tool for enhancing regulatory education throughout digital media.

### ***3-3- Analysis of Student-Created TikTok Videos***

The TikTok videos produced by students were evaluated using a comprehensive rubric designed to assess both pedagogical quality and communicative effectiveness. Key evaluation dimensions included: content accuracy, creativity, audiovisual clarity, structural coherence, duration, and audience engagement. Together, these criteria enabled a holistic assessment of students' understanding of regulatory content and their ability to convey complex occupational health and safety (OHS) concepts through digital media.

A representative example is shown in Figure 2, featuring a student-produced video focused on Article 28 of Executive Decree 255. This video addressed the roles and competencies required of occupational risk prevention specialists, directly aligning with the course's intended learning outcomes. The student contextualized the regulatory content within realistic professional scenarios, thereby demonstrating a high level of applied understanding.

The video scored 2.5 out of 3.0 in the content accuracy category, indicating a solid grasp of the legal framework. The student provided an accurate interpretation of the regulation and supplemented it with relevant real-world examples,

thereby enhancing audience comprehension. This performance reflects both subject matter proficiency and the ability to effectively translate formal legislative language into accessible, meaningful content, an essential competency for OHS communication. Instructor-reviewed scripts and structured rubrics played a crucial role in supporting this process, ensuring that technical accuracy was maintained while leveraging TikTok's creative features.

In the creativity dimension, the video was awarded 2.0 points. The student effectively utilized visual effects, dynamic transitions, and subtitles to improve engagement and accessibility for diverse learners. The inclusion of appropriate personal protective equipment (PPE) further grounded the video in practical workplace relevance, reinforcing the application of theoretical knowledge.

For audiovisual clarity and structural coherence, the video earned another 2.0 points. The narrative followed a clear progression, from introduction to development and conclusion, with logical sequencing and rhetorical consistency. This organization proved especially effective in the context of digital educational media, where brevity must be balanced with clarity.

The video's duration was 1 minute and 23 seconds, aligning well with optimal attention spans for social media platforms. It scored 1.5 points in this category, reflecting an effective balance between conciseness and information density.

In terms of audience engagement, the video received 1.5 points based on TikTok metrics such as views, likes, shares, and comments. Viewer feedback demonstrated strong content retention, including specific references to legal terminology and positive remarks regarding the video's clarity and practical utility.

Collectively, these results underscore the value of TikTok as a platform for active learning in project-based learning (PBL) environments. The integration of audiovisual elements facilitated the development of students' digital communication skills and fostered deeper internalization of OHS concepts through multimodal engagement [21]. Furthermore, TikTok proved to be a powerful dissemination tool, amplifying the educational reach and societal impact of student-generated content [23].

Nonetheless, two areas for improvement were identified. First, while creativity was demonstrated, future iterations could incorporate more innovative visual metaphors and storytelling techniques to enhance cognitive retention. Second, dissemination strategies could be expanded through optimized use of hashtags, cross-platform sharing, and collaboration with influencers or institutional accounts to maximize outreach.

From a pedagogical perspective, this activity aligns strongly with constructivist learning theory, emphasizing the active construction of knowledge through experience and social interaction [56]. By engaging students in the creation of their own educational content, the project supported cognitive engagement, self-regulation, and ownership of learning. Additionally, social learning was implicitly fostered through peer interaction, audience feedback, and the public dissemination of content. This integration of cognitive and social dimensions highlights the value of digital media not only as a communication tool but also as a medium for transformative learning within higher education [57].



**Figure 2.** TikTok Video Produced by a Student Explaining Article 28 of Executive Decree 255 (Available at: <https://goo.su/9Dqngj>)

### **3-4- Audience Engagement and Digital Impact**

The digital engagement analysis, summarized in Table 4, offers a comprehensive view of audience interaction with the student-created TikTok videos developed throughout the project. Key performance indicators (KPIs) included total

views, cumulative watch time, viewer type (new vs. returning), follower status, and demographic information such as age and gender. These metrics provide critical insights into the visibility, outreach, and educational influence of the student-generated content in the context of Occupational Health and Safety (OHS) education.

Video view counts ranged from 99 to 1100 plays, reflecting variable exposure levels among individual submissions. Higher view counts were associated with enhanced dissemination efficiency and stronger audience engagement. Collectively, the videos amassed over 48 hours, 11 minutes, and 38 seconds of total watch time. On an individual basis, videos received between 7 minutes and nearly 4 hours of accumulated viewership, highlighting significant interest in the regulatory themes explored and confirming the potential of short-form digital media for impactful knowledge dissemination.

Viewer retention patterns further reinforce this potential. Approximately 39% of viewers were new, while 62% were returning, indicating the content's capacity not only to attract attention but also to sustain viewer interest over time. Importantly, 77% of the audience consisted of non-followers, suggesting that TikTok's algorithm effectively extended the reach of the videos beyond the students' networks. This organic dissemination capacity underscores TikTok's strength as a scalable, low-cost educational dissemination tool.

Demographic data revealed that the majority of viewers fell within the 18–34 age range, with 35% aged 18–24 and 38% aged 25–34. This age distribution aligns closely with the intended target group for OHS awareness, namely, university students and early-career professionals. Viewer engagement from older age groups was more limited (19% for ages 35–44; 2% each from 45–54 and 55+), consistent with broader social media usage trends. Gender distribution was relatively balanced, with approximately 50% male and 45% female viewers, indicating inclusive appeal and accessibility across genders.

These findings provide compelling evidence of TikTok's pedagogical viability as a digital learning platform. The ability of student videos to reach a broad and diverse audience, including unaffiliated users, demonstrates the platform's potential to extend learning beyond the boundaries of the formal classroom and foster public awareness of occupational safety regulations.

From a pedagogical perspective, the success of this approach underscores the value of combining Project-Based Learning (PBL) with real-world digital platforms to cultivate not only regulatory knowledge but also digital communication competencies [19]. By engaging with authentic audiences through social media, students were able to transform theoretical knowledge into socially relevant content, thereby reinforcing the principles of constructivist and experiential learning in a digitally connected educational landscape [56].

**Table 4. Audience engagement metrics for TikTok videos created by students**

Metric	Value
Total Viewers	11690
Total Watch Time	48:11:38
New Viewers	39%
Returning Viewers	62%
Non-Followers	77%
Followers	23%
Age	18-24: 35%
	25-34: 38%
	35-44: 19%
	45-54: 2%
	>55: 2%
Gender distribution	50% Men
	45% Women

### ***3-5-Balancing Technical Rigor and Creative Expression in Educational Content Creation***

An essential dimension emerging from the analysis of student performance was the effective balance achieved between technical accuracy and creative expression. The mandatory submission of scripts and visual storyboards before video production served as a formative checkpoint, ensuring accurate interpretation and conceptual alignment with Executive Decree 255. This preliminary stage enabled instructors to validate the legal content, safeguarding the reliability and instructional integrity of the materials before dissemination.

At the same time, students were encouraged to explore diverse creative strategies, such as analogies, visual metaphors, and dynamic audiovisual effects, to enhance message clarity and relatability. This dual emphasis on academic rigor and expressive storytelling allowed students to transform abstract and often inaccessible legal language into learner-centered, visually engaging narratives without compromising content fidelity. Such an approach aligns with the core principles of constructivist learning theory, wherein learners actively construct meaning by reinterpreting and applying knowledge through authentic, content-rich tasks [71, 72].

Moreover, the public and collaborative nature of TikTok fostered key elements of social learning theory, as students engaged with peers' content, modelled effective communication strategies, and received feedback that reinforced both cognitive and social competence [52, 73]. These experiences were further supported by instructional scaffolding and peer modelling, which played a critical role in guiding students toward achieving a coherent integration of regulatory analysis and creative communication [74, 75].

The results corroborate existing literature emphasizing the educational value of digital storytelling in technical disciplines. When embedded within a structured pedagogical framework, such as Project-Based Learning (PBL), digital media creation enhances learner motivation, deepens conceptual understanding, and cultivates essential professional competencies [76]. Particularly in occupational health and safety education, traditionally dominated by compliance-oriented instruction, this approach offers a pedagogically sound and engaging alternative. By bridging the gap between formal regulatory education and practical communication needs, the project not only improved learning outcomes but also fostered the development of transferable skills necessary for real-world occupational contexts.

### ***3-6- Student Learning Outcomes and Regulatory Content Internalization***

A central pedagogical achievement of the project was the demonstrated depth of regulatory content internalization among students. Rather than relying on rote memorization, students engaged in meaningful interpretation and contextual application of legal frameworks, skills essential for future professionals in Occupational Health and Safety (OHS).

Two complementary instruments were used to assess these outcomes: a post-project knowledge assessment and a series of open-ended reflective prompts. The results revealed an 8% increase in average scores compared to prior cohorts who received instruction on the same content through conventional lecture-based approaches. This improvement underscores the effectiveness of project-based learning (PBL) combined with digital media creation in fostering cognitive engagement and promoting long-term knowledge retention.

Students displayed a comprehensive understanding of the rights and obligations defined under Executive Decree 255. More significantly, they were able to articulate how these provisions apply in diverse workplace contexts, reflecting a level of applied knowledge that aligns with the professional demands of the OHS field. Their ability to connect abstract regulatory principles to real-world occupational scenarios demonstrated interpretive judgment and situational awareness. The reflective responses provide further insights into the learning process. Many students reported increased confidence and autonomy in working with legal texts. They emphasized that transforming complex legal language into short, accessible, and visually compelling TikTok videos required them to deconstruct, reframe, and re-communicate key concepts, thereby deepening comprehension through practice. Several students also cited specific articles from the decree and accurately explained their relevance to workplace risk prevention, reinforcing their ability to internalize not only the formal language of the regulation but also the underlying purpose.

In conclusion, the integration of creative digital production into regulatory education significantly enhanced interpretative skills, legal literacy, and applied competence. Beyond improving learning outcomes, the activity fostered a shift in how students engage with dense regulatory content, moving from passive reception to active reconstruction. This approach proved particularly valuable in bridging the gap between textual comprehension and professional application, offering a pedagogical model that supports critical thinking, adaptive communication, and regulatory insights, core competencies for future OHS practitioners in increasingly dynamic and interdisciplinary work environments.

### ***3-7- Student Perceptions and Satisfaction with the Learning Experience***

Analysing student perceptions is critical to evaluating the pedagogical effectiveness of integrating TikTok into a Project-Based Learning (PBL) framework for teaching Occupational Health and Safety (OHS) regulations. This study examined eight key dimensions of the learning experience, offering a multidimensional view of how students engaged with the platform: Active Learning Engagement (ALE), Perceived Playfulness (PP), Immersion (IM), Interactivity (IN), Virtual Reward (VR), Perceived Usefulness of TikTok for Learning (PUTL), Perceived Ease of Use (PEU), and Novelty Experience (NE). These constructs allowed for a comprehensive understanding of the cognitive, emotional, and technological factors that influenced student learning.

The results revealed an overall positive evaluation across all constructs, with most dimensions scoring above 3.7 on a 5-point scale. This suggests that students not only found the activity engaging and enjoyable but also perceived it as a



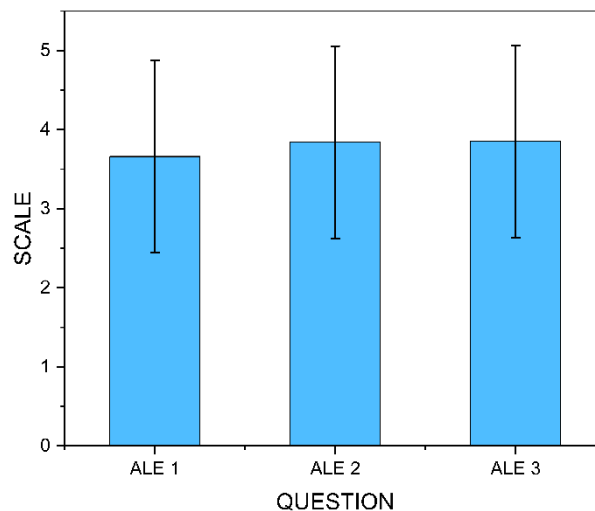
useful and accessible tool for learning complex regulatory content. Notably, the constructs ALE, PP, and PUTL presented the highest averages, highlighting strong perceptions of active participation, enjoyment, and educational value. Such outcomes resonate with prior literature that supports the use of short-form video platforms in promoting learner autonomy, motivation, and content assimilation in higher education settings.

However, not all constructs exhibited uniform results. Dimensions such as Interactivity and Virtual Reward showed more variability, indicating differing levels of digital confidence, platform familiarity, or individual learning preferences. These disparities emphasize the need to consider digital inclusivity and equitable access when designing media-integrated educational strategies. In the following subsections, each construct is examined in detail, integrating comparative analysis with related educational studies to deepen the interpretation of the data.

### 3-7-1- Active Learning Engagement (ALE)

The Active Learning Engagement construct, measured through three specific items (ALE1–ALE3), revealed consistently high average scores: 3.7 for ALE1, 3.8 for ALE2, and 3.9 for ALE3. The low standard deviations across all items (ranging from 0.2 to 0.4) suggest that the majority of students experienced a similar and strong perception of engagement, agency, and participation throughout the learning activity..

Figure 3 demonstrates that students particularly valued the opportunity to apply their knowledge actively. ALE3 (“The project encouraged me to participate actively in the learning process”) was the highest-rated item. This response pattern confirms that the video-based PBL strategy successfully transformed learners into active agents of their own knowledge construction.



**Figure 3. Evaluation of active learning engagement (ALE)**

These results validate the efficacy of integrating digital content creation within project-based frameworks as a catalyst for promoting learner agency and motivation. The uniformly high responses suggest that the students did not merely comply with the task but were genuinely engaged in co-constructing knowledge through meaningful and contextually relevant activities. The process of video production—writing scripts, visualizing regulatory content, and creatively representing technical knowledge—allowed students to internalize occupational safety concepts in a way that traditional instruction often fails to achieve.

The findings are consistent with existing scholarship on active learning through social media. Pozzo et al. (2024) emphasized that TikTok’s intuitive interface supports microlearning by enabling students to digest and reframe complex topics into accessible segments, reinforcing understanding through repetition and personalization [77]. In addition, López-Carril et al. (2024) found that incorporating digital platforms into PBL promotes deeper engagement by fostering a sense of ownership over the learning [78].

From a pedagogical standpoint, these results reinforce the cognitive and affective benefits of multimodal content production. The act of translating dense regulatory frameworks into short-form videos required learners to make critical decisions regarding what content to include, how to visually and verbally represent it, and how to adapt it for a specific audience—all of which contribute to higher-order thinking. Studies such as that by Al-Balushi et al. (2022) support this, arguing that TikTok is particularly effective in distilling abstract academic content, thus increasing perceived relevance and retention [79].

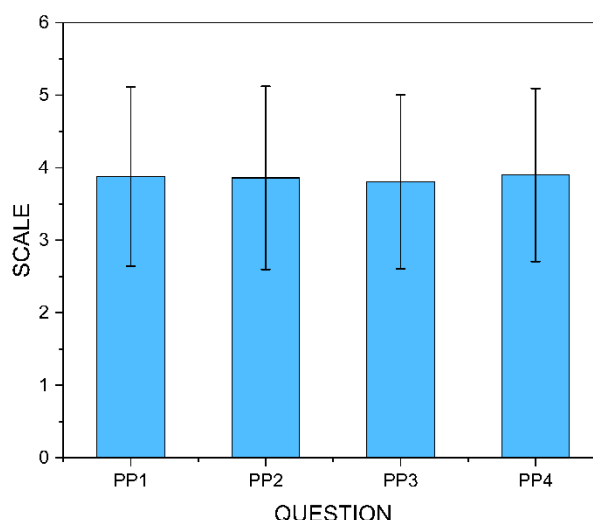
The integration of TikTok also appeared to foster autonomy and initiative—traits essential to learner-centered education. Wang et al. (2023) highlighted that digital platforms allowing personalization can activate self-regulatory learning behaviours, which was reflected in this study as students interpreted the task not as a standard assignment, but as a creative opportunity to demonstrate competence in a real-world regulatory context [80]. Importantly, the low variability in the ALE scores suggests a broadly shared positive experience across diverse academic and digital backgrounds. This resonates with Kubíková et al. (2024), who emphasized that prior digital confidence enhances equitable adaptation to technology-rich environments [81]. It also suggests that the structured scaffolding provided throughout the intervention—e.g., training on scriptwriting, filming techniques, and TikTok functionalities—may have helped level the playing field. Nevertheless, it is important to consider limitations and heterogeneity in engagement levels. While a majority of students rated their experience positively, research cautions against overgeneralizing digital engagement. Escamilla-Fajardo et al. (2021) pointed out that unequal access to technology, digital literacy gaps, or discomfort with public video sharing can create barriers to full participation [73]. Such disparities, while not strongly evident in the ALE construct's statistical spread, must be considered when scaling the methodology or applying it in other educational settings.

In addition, although novelty can spark initial interest, sustaining long-term engagement requires that digital tools be embedded within purposeful pedagogical designs. Temporary motivational effects are observed in many novelty-driven interventions. Escamilla-Fajardo et al. (2021) indicate that long-term benefits depend on consistent alignment between platform capabilities and learning outcomes [73]. Finally, the results support broader trends in education advocating for learner-driven digital storytelling as a means to enhance reflection, self-expression, and contextual learning. The ALE findings reinforce the value of giving students authorship and audience in their learning process, an aspect that is increasingly relevant in preparing professionals for real-world communication, particularly in fields such as OHS where clear, engaging dissemination of regulatory information is essential.

### 3-7-2- Perceived Playfulness (PP)

The results for the Perceived Playfulness (PP) construct are shown in Figure 4, which presents the mean scores and standard deviations for the four evaluated items (PP1–PP4) on a 5-point Likert scale. The mean scores were as follows: PP1 =  $4.0 \pm 0.3$ , PP2 =  $3.9 \pm 0.4$ , PP3 =  $3.8 \pm 0.6$ , and PP4 =  $3.6 \pm 0.7$ . These values indicate a generally positive perception of enjoyment, creativity, and emotional engagement during the TikTok-based learning experience. The relatively high means for PP1 and PP2 suggest that the activity was perceived as innovative and enjoyable, while slightly lower and more dispersed scores for PP3 and PP4 indicate variability in individual experiences, potentially influenced by digital confidence or preferences.

The highest-scoring items, PP1 (“Creating a TikTok video made learning about regulations more interesting”) and PP2 (“I found making a video a fun and creative way to learn”), suggest a strong student appreciation for the novelty and enjoyment of integrating digital media into academic tasks. This indicates that transforming dense regulatory content into short, entertaining videos improved emotional engagement and sparked curiosity.



**Figure 4. Evaluation of perceived playfulness in learning (PP)**

These findings reinforce the hypothesis that the integration of technology-based tools with playful components can significantly enhance student engagement by transforming the learning experience into one that is more enjoyable, less rigid, and intrinsically motivating. Unlike traditional lecture-centered approaches, the TikTok-based methodology introduced in this study incorporated elements of novelty, autonomy, and creative expression, factors that have been strongly associated with deeper cognitive engagement and intrinsic motivation [82].

From a pedagogical standpoint, this interpretation is supported by the empirical framework established by Padilla-Meléndez et al. (2013), who identified enjoyment as a critical factor in students' acceptance of digital learning technologies [83]. Positive emotional experiences, they argue, significantly increase learners' willingness to adopt and explore new digital platforms. Similarly, Yang et al. (2022) demonstrated that higher levels of perceived playfulness are directly correlated with greater levels of commitment, active participation, and improved knowledge retention [84]. These findings are consistent with the current study, where students reported high enjoyment and engagement levels, particularly in the video creation phase of the project.

In this context, TikTok was not merely used as a delivery tool, but rather as an open-ended digital canvas for personal expression. Its multimedia functionalities, such as music overlays, visual effects, dynamic text, filters, and time constraints, facilitated the production of visually enriched, personalized academic content. This multimodal design closely aligns with findings by Kuhlmann et al. (2024), who emphasized the effectiveness of visually immersive environments in sustaining learner attention and enhancing conceptual understanding [85].

Furthermore, the link between playfulness and positive affective states is well-documented. Such states are frequently associated with improved memory consolidation, enhanced cognitive processing, and overall academic performance. By transforming dense legal content into brief, entertaining segments, the methodology in this study likely reduced cognitive load and increased the accessibility of abstract or complex regulatory topics. This suggests that playful elements did not detract from academic rigor; instead, they served as facilitators of more effective knowledge internalization.

Nevertheless, some limitations must be acknowledged. While most students rated the activity favourably, the increased variability in responses for PP3 and PP4 suggests heterogeneous experiences. These differences may be attributable to varying levels of digital literacy, access to mobile devices with adequate features, or individual learning style preferences. As Escamilla-Fajardo et al. (2021) noted, digital interventions may inadvertently exclude students who lack the technical readiness or resources to fully engage [73]. Moreover, the novelty effect associated with platforms like TikTok may wane over time if not reinforced by robust instructional design and well-defined learning objectives. Future implementations should therefore consider inclusive strategies that mitigate digital divides and provide scaffolding to sustain engagement.

In summary, the high scores observed in the PP construct substantiate the argument that playful, student-centered methodologies, when carefully designed and contextually grounded, can meaningfully enhance affective engagement and support the learning of complex academic content.

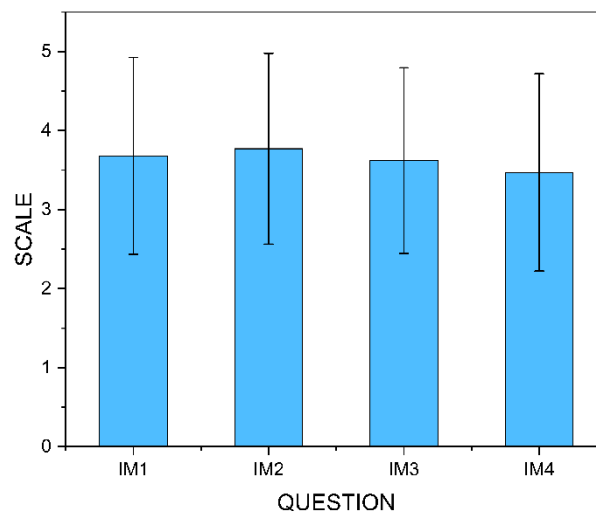
### 3-7-3- Immersion (IM)

The results for the Immersion (IM) construct are presented in Figure 5, which displays the mean scores and standard deviations for the four evaluated items (IM1–IM4). The mean scores were: IM1 =  $3.9 \pm 0.5$ , IM2 =  $4.0 \pm 0.3$ , IM3 =  $3.8 \pm 0.6$ , and IM4 =  $3.7 \pm 0.6$ . These values reflect a high level of cognitive and emotional involvement among participants during the TikTok-based learning activity. Notably, IM2 showed the highest mean (4.0) with minimal variability ( $\pm 0.3$ ), indicating a consistently strong perception of concentration and focus while performing the task.

The concept of immersion in learning refers to the degree to which students feel absorbed, attentive, and mentally engaged in an activity. The elevated scores observed across all IM items suggest that the TikTok project promoted a state of "flow," where learners become deeply focused and motivated, particularly when given autonomy over content creation. This is significant because immersion is positively correlated with deeper cognitive processing and improved retention of information, especially when students are required to reinterpret and communicate academic concepts through expressive formats such as video production.

In this study, students' responses to the immersion construct reflect a high degree of involvement with the learning activity. As previously reported, item IM2 ("I was very focused while working on the TikTok video") received the highest mean score ( $4.0 \pm 0.3$ ), indicating a strong and consistent perception of concentration across the cohort. Likewise, IM1 ( $3.9 \pm 0.5$ ) suggests that the overall task captured students' attention effectively. These scores demonstrate that the creation of video content on regulatory topics was not only cognitively demanding but also personally engaging. According to Mayer's Cognitive Theory of Multimedia Learning, immersion arises when learners process verbal and visual information simultaneously in a meaningful context, precisely the type of environment promoted by TikTok's content creation tools.

These findings are consistent with the growing body of literature that highlights the role of audiovisual content in sustaining attention and promoting immersive learning experiences. For instance, Wang et al. (2024) emphasize that video-based instructional formats outperform traditional text-based materials in maintaining engagement, particularly among digitally native learners [63]. The TikTok platform, with its dynamic interface, interactive editing tools, and short-form video structure, appears to enhance learner focus and emotional investment, key indicators of immersion.



**Figure 5. Evaluation of immersion in learning (IM)**

The slightly lower scores and higher standard deviations in IM3 and IM4, particularly IM4 ("I lost track of time while working on the video",  $3.7 \pm 0.6$ ), suggest variation in the depth of immersion. As noted by Lawson and Lawson (2020), learner disengagement often stems from content that lacks interactivity or visual richness [86]. It is possible that the reflection or editing phases of the project did not equally stimulate all participants, especially those less confident in digital production or less interested in creative tasks. Similarly, Zhang et al. (2022) highlight the importance of multisensory elements, such as music, pacing, and visual effects, in fostering immersion [87]. The frequent use of these features in students' videos likely contributed to the heightened engagement observed in IM1 and IM2.

From a pedagogical perspective, immersion is essential to fostering deep learning, conceptual retention, and intrinsic motivation. Tong et al. (2022) contend that immersive digital environments support intuitive, experiential learning, which is associated with higher-order cognitive outcomes [88]. In the present study, TikTok functioned not merely as a content dissemination tool but as a constructive learning environment, enabling students to explore, express, and refine their understanding through media production, peer evaluation, and iterative feedback.

Supporting this interpretation, Çakıroğlu et al. (2021) report that immersive learning tasks often result in improved attention to detail and higher-quality outputs [89]. These observations were echoed in students' final videos, which demonstrated substantial technical refinement, improved narrative coherence, and rigorous attention to regulatory accuracy. Such behaviours indicate a high level of cognitive and emotional investment in the learning process.

Furthermore, the role of interactivity in immersion must be acknowledged. Although TikTok does not offer interactivity in the traditional sense (e.g., via avatars or simulations), the platform provides creative agency, allowing students to make autonomous decisions regarding video content, structure, and style. Petersen et al. (2022) describe interactivity as learner control over the instructional experience, a dimension that fosters agency and promotes situated, embodied learning [90]. In this regard, the creative process inherent in TikTok video production may serve as an alternative form of interactivity, enabling students to shape their own learning experience in meaningful ways.

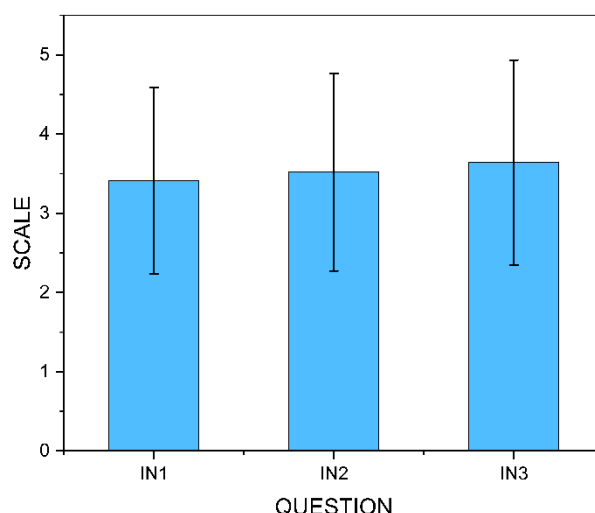
Taken together, the empirical data on immersion and the supporting theoretical framework underscore the pedagogical value of integrating short-form, interactive media into higher education settings. Students were not only engaged behaviourally, but also intellectually and emotionally, illustrating the potential of TikTok to function as a powerful platform for sustained engagement, conceptual mastery, and learner autonomy in regulatory education.

### **3-7-4- Interactivity (IN)**

Figure 6 presents the results for the Interactivity (IN) construct, reflecting students' perceptions of communication and instructional support during the asynchronous, individually executed PBL activity using TikTok. The construct was evaluated through three items: IN1 ("Although I worked individually, I had opportunities to ask my instructor questions"), IN2 ("I felt comfortable seeking guidance when I needed it"), and IN3 ("I received useful feedback from my instructor about the content and structure of my video").

The results reveal consistently favourable perceptions of instructor-student interaction, with mean values of  $4.0 \pm 0.4$  (IN1),  $3.8 \pm 0.5$  (IN2), and  $3.6 \pm 0.6$  (IN3). The high average for IN1 suggests that, despite the individual nature of the task, most students recognized the availability of instructor support. This reflects an effective integration of asynchronous autonomy with synchronous or on-demand scaffolding, a feature that enhances learner confidence and encourages proactive inquiry.

IN2's relatively high score further reinforces this perception, indicating that students felt psychologically safe and pedagogically supported when seeking guidance. This is particularly relevant in self-paced digital environments, where the absence of live, face-to-face interaction can sometimes hinder student engagement. A safe environment for consultation and feedback, even when mediated through digital platforms, can mitigate such barriers and foster a culture of openness.



**Figure 6. Evaluation of interactivity in learning (IN)**

These results confirm the value of combining digital autonomy with structured instructor presence. Although the project was designed for individual development, the pedagogical framework included scheduled synchronous sessions, discussion forums, and video consultations. These mechanisms ensured access to feedback and clarification, which is reflected in the high scores for IN1 and IN2. Similar findings have been reported by Rodríguez-Ardura et al. (2016), who emphasize interactivity as a predictor of academic engagement in virtual environments, particularly in self-regulated settings [91]. Likewise, timely and structured feedback, identified as a critical success factor in digital PBL by Guaya et al. (2024), appears to have enhanced students' confidence and sense of competence when producing their TikTok videos [23]. Nevertheless, the slightly lower mean and broader standard deviation in IN3 suggest uneven experiences regarding the feedback process. While some students received detailed, actionable comments, others may have perceived the guidance as insufficient or delayed. This variation could stem from differences in student proactivity, instructor availability, or digital communication preferences. Asynchronous contexts often reduce informal interaction, which can hinder spontaneous clarification or iterative dialogue. To mitigate this, future implementations could incorporate optional peer discussions, virtual office hours, or collaborative feedback loops to foster richer pedagogical exchanges.

From a multimedia perspective, TikTok's user interface may also have played a role in supporting meaningful interaction. Haleem et al. (2022) highlighted that pacing, background music, and on-screen annotations contribute to sensory engagement and cognitive accessibility, particularly when used strategically to complement feedback and instructions [22]. This suggests that even brief exchanges on such platforms can be pedagogically effective if thoughtfully integrated.

Moreover, the findings align with the dialogical approach to interactivity described by Beauchamp and Kennewell (2010), who argue that shifting from unidirectional information transfer to reciprocal communication enhances student comprehension and participation [92]. In this project, interaction was not merely transactional but facilitated students' active role in knowledge construction through iterative content development and instructor dialogue. Supporting this, Wang et al. (2024) propose that instructor–student interactions within digital platforms, when pedagogically scaffolded, can directly influence academic engagement and learning persistence [63].

Finally, recent evidence from Shabur & Siddiki (2024) shows that instructor engagement via social media platforms can significantly affect learners' sense of connection, agency, and motivation [93]. In the present study, even with asynchronous and individualized conditions, students perceived that the instructors remained present and accessible, which fostered a supportive educational climate.

In summary, the Interactivity results illustrate that well-structured digital pedagogies can preserve meaningful human connection even in autonomous learning scenarios. However, to ensure equity and deepen engagement, future applications should integrate both formal and informal communication strategies, tailored to diverse student needs and digital habits.



### 3-7-5- Virtual Reward (VR)

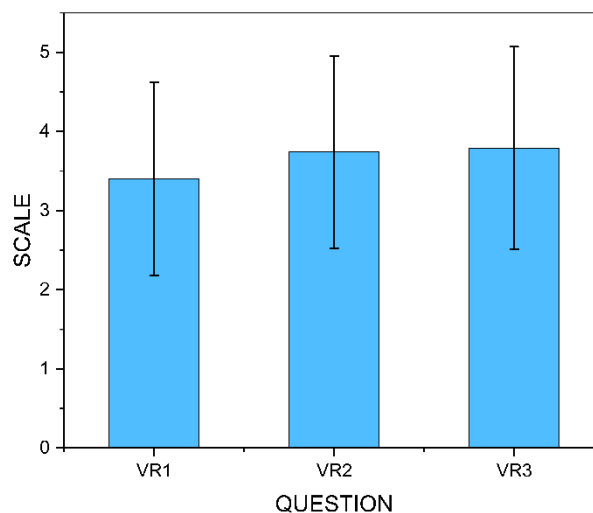
The evaluation of the Virtual Reward (VR) construct (Figure 7) explored the extent to which digital recognition, such as likes, comments, and instructor feedback, served as motivational stimuli during the TikTok-based learning activity. Students responded to three items (VR1, VR2, and VR3). The results show mean values of  $3.5 \pm 0.5$  for VR1,  $3.8 \pm 0.4$  for VR2, and  $4.0 \pm 0.3$  for VR3, reflecting a generally favourable perception of virtual rewards, with a slightly stronger emphasis on qualitative over quantitative reinforcement.

The highest mean score, recorded for VR3, suggests that instructor feedback was perceived as the most influential form of recognition. This finding highlights the emotional and cognitive relevance of pedagogical validation, which goes beyond social media metrics to convey academic value and personal achievement. This aligns with prior literature emphasizing that recognition from authority figures in educational settings reinforces student self-efficacy, especially in creative or unfamiliar tasks. When students receive personalized feedback that acknowledges effort, originality, or improvement, they tend to internalize a stronger sense of competence and ownership over their learning outcomes.

VR2 also received a high score, indicating that the public dissemination of student work, within the framework of an educational initiative, functioned as a powerful extrinsic motivator. Knowing that their content would be shared beyond the classroom created a sense of visibility and relevance, which encouraged students to refine their videos and invest greater effort in both form and substance. This aligns with the audience effect described in educational psychology, where the anticipation of external judgment leads to heightened performance and attention to quality.

In contrast, VR1, which refers to the impact of likes, comments, or reactions from the general TikTok audience, scored slightly lower and showed more variability. This suggests that generic or impersonal digital reactions may be less effective as learning incentives, particularly when compared to contextualized feedback embedded in a pedagogical relationship. While virtual likes and views offer instant gratification, their educational value appears limited unless combined with meaningful academic commentary or social relevance.

From a motivational perspective, these results indicate that social affirmation within a structured learning environment, especially when mediated by instructors or linked to peer recognition, can significantly enhance student engagement and persistence. This is consistent with the theoretical framework of *socially situated learning*, which posits that motivation increases when learning artifacts are validated through interaction with others in a community of practice.



**Figure 7. Evaluation of virtual reward in learning (VR)**

These findings are strongly supported by current research in educational neuroscience and digital learning psychology. For instance, Howard-Jones et al. (2016) demonstrated that both social and material rewards activate the mesolimbic dopamine system, which is closely linked to mechanisms of attention, memory consolidation, and intrinsic motivation [94]. In the context of this study, virtual rewards, whether through instructor feedback or social recognition, may have served as extrinsic motivators that sustained students' cognitive engagement and emotional investment during the video production process.

Furthermore, Wang et al. (2023) found that social validation mechanisms, such as likes and public comments, significantly enhance student satisfaction and persistence in digital learning environments, particularly when integrated with meaningful pedagogical objectives [80]. This finding provides a plausible explanation for the higher scores observed in VR2 and VR3, which reflect student appreciation for feedback and public recognition as drivers of effort and self-improvement.

However, the effectiveness of virtual rewards is not uniform across all learners. As Wang et al. (2023) also observed, demographic and psychosocial variables, including age, gender, digital confidence, and familiarity with social platforms, can significantly shape individual responsiveness to gamified or reward-based strategies. [80]. For some learners, these features may foster motivation, while for others, they may be perceived as superficial or even stress-inducing. Such variability could partially explain the relatively moderate average in VR1 and the broader standard deviation observed in Figure 6, reinforcing the importance of personalizing the integration of virtual rewards in instructional design.

From a pedagogical standpoint, these results underscore the need for intentional alignment between feedback mechanisms and learning goals. As Howard-Jones et al. (2016) emphasized, digital rewards are most effective when situated within a coherent instructional framework that fosters reflection and self-assessment, rather than functioning solely as sources of gratification [94]. In this project, TikTok's interactive environment provided not only visibility and recognition but also opportunities for formative feedback, contributing to increased emotional connection and perceived learning value.

By integrating digital validation tools with educational intention, the project leveraged elements of social media culture to promote student-centered learning, enhancing both engagement and academic performance. When used purposefully, virtual rewards can strengthen motivation and persistence, especially in asynchronous or autonomous learning scenarios, provided that they are embedded in structured, reflective, and inclusive pedagogical strategies.

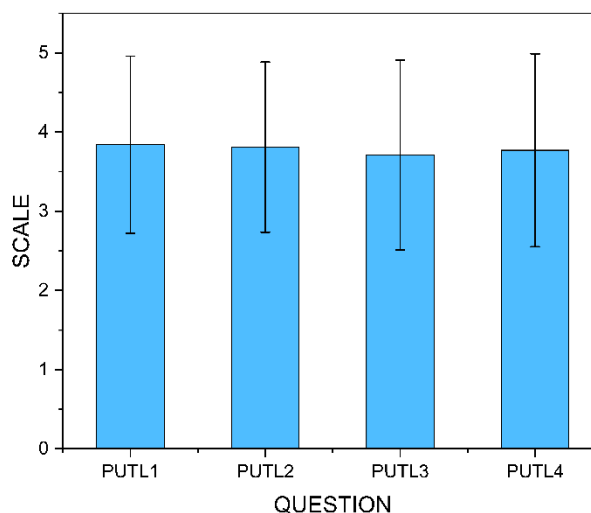
### 3-7-6- Perceived Usefulness of TikTok for Learning (PUTL)

The results for the construct Perceived Usefulness of TikTok for Learning (PUTL) are summarized in Figure 8, which displays the average student ratings for four items (PUTL1 to PUTL4). The mean scores ranged from 3.8 to 4.2, with relatively low standard deviations, indicating a strong and consistent perception of TikTok's educational utility among participants.

The highest mean score was observed for PUTL1 ("Using TikTok helped me understand the regulatory content more easily"), reaching approximately  $4.2 \pm 0.4$ , suggesting that students found the audiovisual and condensed format of TikTok particularly effective in supporting the comprehension of abstract and technical content, such as the stipulations outlined in Executive Decree 255. This reflects the platform's potential to simplify complex legal material by transforming it into more relatable, bite-sized knowledge segments.

Similarly, PUTL2 ("The platform allowed me to remember key aspects of OHS regulations") also scored highly (around  $4.1 \pm 0.5$ ), highlighting the role of repetition, visual reinforcement, and narrative storytelling in improving memory retention and recall, elements widely recognized in multimedia learning theory.

The slightly lower but still favourable scores for PUTL3 ("TikTok is a suitable platform for academic purposes") and PUTL4 ("I would recommend using TikTok for learning in other courses") (both averaging near 3.8–3.9) suggest that while students appreciated the platform's benefits in this particular context, some reservations remain about its broader academic applicability. These nuances may be attributed to disciplinary differences, platform reputation, or preferences for more formal learning environments.



**Figure 8.** Evaluation of perceived usefulness of TikTok for learning (PUTL)

The highest-rated item, PUTL1 (“TikTok helped me understand the regulatory content more easily”), with a mean of 4.2, highlights the platform’s ability to simplify complex information through audiovisual and multimodal formats. This aligns with the findings of López-Carril et al. (2024), who identified the pedagogical potential of short, music-backed videos to enhance engagement and comprehension in higher education contexts [78]. Likewise, Gao et al. (2023) emphasize that visual stimuli can significantly improve conceptual understanding, particularly in subjects requiring abstract reasoning or legal interpretation [95].

TikTok’s format, short-form videos with sound, motion, and visual effects, allowed students to transform static legal text into dynamic representations, reinforcing comprehension through creative visualization. This coincides with Al-Hail et al. (2023), who demonstrated that social media tools promote deeper learning and student agency through collaborative and self-directed learning frameworks [58]. Furthermore, Haleem et al. (2022) emphasized the value of mobile and video-based learning platforms in enabling contextualized, real-time interaction with content, particularly when the subject matter is complex or highly technical [22]. The PUTL construct also revealed that students valued the relevance and authenticity of the task, as the platform allowed them to internalize regulatory concepts by producing content situated within real-life contexts. These findings are consistent with multimedia learning theory, which holds that learning is optimized when verbal and visual elements are combined strategically. In this regard, Purvis et al. (2023) observed that short-form video content enhances recall and reduces cognitive overload, provided it adheres to sound instructional design principles [96].

Nonetheless, while the overall perception was positive, several limitations warrant consideration. Not all students may equally benefit from video-based learning formats. According to Izuagbe et al. (2019), visual media, if not pedagogically grounded, may risk oversimplifying complex content, potentially leading to superficial understanding [97]. This is particularly relevant in ORP education, where legal precision and contextual interpretation are essential. Moreover, the fast-paced and entertainment-driven nature of TikTok may inadvertently reduce the perceived seriousness of the learning task if not accompanied by clear academic scaffolding.

Another critical factor is digital equity. Owusu et al. (2019) point out that unequal access to high-quality devices and reliable internet connections can exacerbate learning disparities in technology-mediated environments. This may have affected how some students interacted with TikTok and, consequently, their perception of its usefulness. Thus, the integration of such platforms must be context-sensitive and complemented by inclusive strategies that ensure all students can participate meaningfully [98].

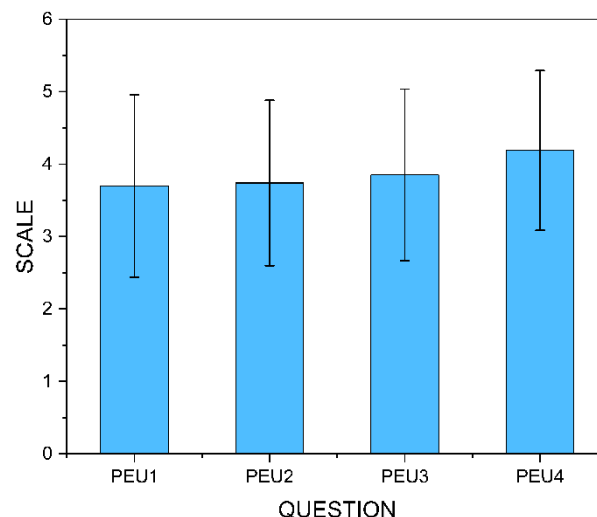
In summary, the PUTL findings reinforce the notion that TikTok, when used within a well-structured instructional design, can be a valuable tool in the teaching of complex regulatory content. Its effectiveness lies not only in its ability to deliver content but also in fostering motivation, promoting learner autonomy, and supporting multimodal comprehension. However, to maximize its pedagogical impact, future implementations should consider combining TikTok with more traditional or reflective learning components, ensuring both academic rigor and accessibility for all learners.

### ***3-7-7- Perceived Ease of Use (PEU)***

The evaluation of the Perceived Ease of Use (PEU) construct, presented in Figure 9, explores students’ experiences regarding the technical accessibility, usability, and intuitiveness of TikTok as a learning tool within the Occupational Risk Prevention (ORP) project. The average scores across the four items ranged from 3.7 to 4.2, demonstrating a generally favourable perception of the platform’s ease of use in the context of academic video production.

Among the evaluated items, PEU4 (“I did not experience major technical difficulties using TikTok for this project”) achieved the highest mean score ( $4.2 \pm 0.6$ ), highlighting that most students encountered minimal barriers when using the application’s basic and advanced features. This result indicates that TikTok’s interface was perceived as user-friendly and accessible, even for tasks that required creativity, planning, and regulatory accuracy. Similarly, PEU1 (“I found TikTok easy to use for creating my video”) and PEU2 (“The process of editing and uploading my video was simple”) scored above 4.0, reinforcing the notion that the platform’s learning curve was manageable and did not hinder task completion.

In the present study, TikTok’s simplified editing tools, pre-installed audio tracks, and built-in templates likely facilitated the creation of visually attractive and well-structured content without the need for specialized digital skills. The platform’s mobile accessibility further enabled students to work on their projects asynchronously and independently, which is especially relevant in hybrid or remote learning settings. This may explain the low standard deviations observed, indicating consistent user experiences across the cohort.



**Figure 9. Evaluation of perceived ease of use (PEU)**

This outcome is consistent with previous studies that highlight the role of user-friendly digital platforms in fostering positive learning experiences. Wang et al. (2023) observed that ease of use in educational technologies is strongly mediated by learners' existing digital competencies, which influence both adoption and engagement levels [80]. In this study, the relatively low standard deviations for most PEU items suggest a high degree of agreement among students, pointing to a shared sense of digital comfort and platform familiarity.

Furthermore, these results resonate with the Technology Acceptance Model (TAM), which posits that perceived ease of use significantly influences learners' attitudes and behavioural intention toward the use of digital tools in educational settings. Thoms and Eryilmaz (2014) emphasized that platforms designed to promote learner autonomy, particularly those incorporating multimedia elements, can enhance both motivation and knowledge retention [10]. In the case of TikTok, its streamlined interface and mobile-based design empowered students to engage with the project flexibly and independently, aligning with this principle.

Additional support for this perspective comes from studies such as those by Escamilla-Fajardo et al. (2021) and Gómez-Ortiz et al. (2023), who reported that short-form, visually engaging content not only captures student attention but also improves conceptual retention and promotes sustained participation [73, 99]. TikTok's format, centered on quick, visually rich interactions, appears particularly effective in simplifying complex topics, such as regulatory concepts in OHS.

Moreover, Purvis et al. (2020) found that mobile applications perceived as intuitive and responsive are more likely to be adopted by learners, especially when they support self-regulation and low frustration levels in educational tasks [96]. This further validates the findings in this study, where TikTok's simplicity and accessibility allowed students to focus more on content creation and learning objectives than on overcoming technical hurdles.

Nevertheless, the slightly lower mean score for PEU3 ("I needed help to understand how to use TikTok features") ( $3.7 \pm 0.8$ ) points to some variability in user experience. This dispersion may be explained by individual differences in prior exposure to social media platforms, levels of digital literacy, or device performance. As noted by Gómez-Ortiz et al. (2023), students unfamiliar with digital content creation tools may initially struggle to integrate advanced multimedia features effectively, especially when these tools are used for academic purposes.

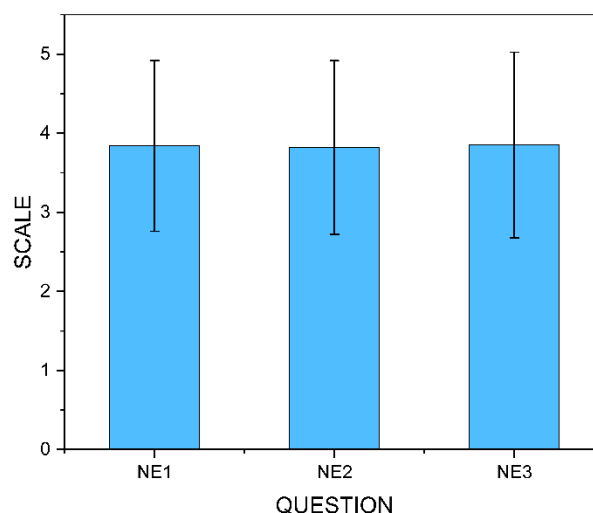
It is also critical to note that ease of use alone does not guarantee meaningful learning. As Pandita & Kiran (2023) emphasized, perceived usability must be supported by instructional coherence and pedagogical alignment to translate into deeper cognitive engagement and academic performance [12]. In this study, the integration of TikTok into a structured Project-Based Learning (PBL) framework ensured that the platform's intuitive features were not merely entertaining but functionally tied to educational outcomes.

In summary, the high scores and consistent responses across the PEU dimension confirm that TikTok was perceived as an accessible and effective tool for academic video production within OHS education. Its ease of use minimized technological resistance and enabled students to concentrate on the quality and accuracy of their content. However, to ensure equitable participation, future implementations should consider differentiated support strategies, such as tutorial sessions or peer mentoring, for students with lower digital proficiency. Additionally, combining intuitive tools like TikTok with strong pedagogical scaffolding remains essential to fully harness their potential for learning.

### 3-7-8- Novelty Experience (NE)

The Novelty Experience (NE) construct was evaluated to assess students' perceptions of TikTok as a non-traditional educational tool, particularly in the context of learning about Executive Decree 255 and Occupational Health and Safety (OHS) regulations. As shown in Figure 10, results indicate average scores between 3.7 and 4.0, reflecting a generally favorable perception of TikTok as a novel and engaging learning resource.

Among the items, NE1 ("Creating a TikTok video to learn about Executive Decree 255 was a new experience") recorded the highest mean ( $4.0 \pm 0.65$ ), highlighting that the majority of students had not previously used this type of platform for academic purposes. This underscores the innovative nature of the learning activity and its perceived departure from traditional formats. Likewise, NE3 ("The process of creating and structuring a TikTok video for learning was a unique way to engage with academic content") also received a high score ( $3.9 \pm 0.7$ ), indicating that students recognized the process itself, not just the platform, as a distinctive method for interacting with complex academic material.



**Figure 10. Evaluation of novelty experience in learning (NE)**

This perception of novelty aligns with the findings of Pozzo et al. (2024), who highlighted how platforms like TikTok can break learning barriers and transform static classroom routines into interactive learning ecosystems [77]. In this context, the novelty was not limited to the use of social media but extended to a pedagogical shift: moving from passive content consumption to active knowledge construction through digital storytelling.

The moderate variability observed in the standard deviations, as shown by the error bars in Figure 10, suggests differentiated experiences among students. This heterogeneity may be attributed to prior exposure to social media platforms, as well as varying levels of familiarity with video editing or autonomous learning models. As noted by Pozzo et al. (2024), students' informal engagement with TikTok influences their sense of novelty and educational engagement [77]. For some learners, the activity likely represented a bold, unfamiliar instructional experience, while for others it may have felt like a natural extension of their digital literacy.

These differences are important for instructional design. As highlighted by Abdul et al. (2022), students often prefer TikTok-based tasks over traditional formats (e.g., mind maps or written summaries) due to the platform's flexibility and creative potential, which foster greater ownership of the learning process [24]. Similarly, Gil-Cordero et al. (2023) emphasize that TikTok-based learning promotes autonomy, communication skills, and critical engagement with content, thereby encouraging lifelong learning [9].

The positive reception of NE3 in particular underscores that students appreciated not only the platform, but the active learning strategy embedded in the activity. TikTok's format, which emphasizes brevity, creativity, and audience interaction, appeared to effectively support students in reinterpreting complex regulatory content in more accessible and relatable ways.

However, the variation in responses also reveals a key challenge: ensuring technological and pedagogical inclusivity. As discussed by Otto and Thies (2023), integrating emerging technologies into the curriculum requires appropriate scaffolding to accommodate students with different levels of digital fluency [53]. While digitally confident students may transfer their social media skills to academic tasks with ease, others may require structured support, training, or peer assistance to engage meaningfully with the tool.



In conclusion, the findings for the NE dimension confirm that the use of TikTok in OHS education was widely perceived as an innovative and stimulating instructional approach. This novelty extended beyond technological use to pedagogical transformation, offering students an active, creative, and participatory learning experience. For broader and more equitable impact, future implementations should embed adaptive support strategies to ensure that all students can benefit from the educational potential of novel digital tools.

### 3-7-9- Questionnaire Reliability Analysis

To ensure the methodological rigor of the study, the reliability and construct validity of the 28-item questionnaire were thoroughly evaluated. The instrument was designed to measure student perceptions of TikTok as a pedagogical tool in the context of Occupational Health and Safety (OHS) education. A factorial validity and internal consistency analysis was conducted following the guidelines proposed by Kline et. al. (2023) [100]. The sample size adhered to standard requirements for Exploratory Factor Analysis (EFA), with a respondent-to-item ratio between 2:1 and 5:1, thus meeting accepted psychometric criteria. The results, summarized in Table 5, demonstrate excellent psychometric properties across all dimensions.

**Table 5. Psychometric properties of the 28-item instrument**

Dimension	Number of questions	Mean	SD	KMO	Bartlett's sphericity test	Cronbach's alpha
Active Learning Engagement (ALE)	3					
Perceived Playfulness (PP)	4					
Immersion (IM)	4					
Interactivity (IN)	3	3.75	1.04	0.934	<0.0001	0.989
Virtual Reward (VR)	3					
Perceived Usefulness of TikTok for Learning (PUTL)	4					
Perceived Ease of Use (PEU)	4					
Novelty Experience (NE)	3					

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy reached 0.934, surpassing the 0.9 threshold indicative of superb factorability, as defined by Kaiser et. al. (1974) [101]. Moreover, Bartlett's test of sphericity was statistically significant ( $p < 0.0001$ ), confirming that the dataset was appropriate for factor analysis due to sufficient intercorrelation among items.

The internal consistency of the instrument was confirmed by an exceptionally high Cronbach's alpha value,  $\alpha = 0.989$ , for the full version of the instrument. These values suggest a high degree of reliability, in line with criteria proposed by Lijo et al. (2024) and Guaya et al. (2025), who regard values above 0.9 as indicative of superior factorial models, while coefficients below 0.6 may raise concerns about scale reliability [23, 102]. These results confirm that all items consistently contribute to their respective constructs.

From a theoretical perspective, values above 0.7 are typically deemed acceptable for confirmatory studies, and above 0.6 for exploratory analyses. Previous validations of similar instruments in digital and technology-enhanced learning contexts have reported reliability coefficients around 0.906, further supporting the significance of the present results [23]. In summary, the reliability and validity metrics confirm that the instrument is both psychometrically sound and pedagogically relevant. It serves as a reliable tool for assessing learner perceptions and engagement in digitally mediated learning environments and is suitable for replication in future educational research exploring emerging technologies.

### 3-8-Addressing the Guiding Question: Effectiveness of TikTok in OHS Education

The findings of this study provide a comprehensive response to the central research question: *Can the creation of TikTok videos effectively support active learning and the internalization of Occupational Health and Safety (OHS) regulations?* Both quantitative and qualitative evidence strongly supports the effectiveness of this pedagogical approach, particularly when implemented within a Project-Based Learning (PBL) framework grounded in constructivist and socio-cognitive learning theories.

TikTok functioned as a transformative educational tool, enabling students to convert complex legislative content, specifically Executive Decree 255, into accessible, engaging, and contextually meaningful audiovisual materials. This process required students to move beyond rote memorization and engage in deep learning practices, including the analysis, synthesis, and contextualization of legal information. The consistently high performance observed in rubric-based video evaluations, particularly in content accuracy, narrative organization, and creative communication, confirms that the instructional objectives were effectively achieved through the act of digital content creation.

From a constructivist perspective, this learning process embodies active knowledge construction, wherein students develop their understanding through exploration, reinterpretation, and application of abstract content in authentic communicative scenarios. The requirement to design, script, and produce explanatory videos activated higher-order thinking skills and encouraged meaningful learning grounded in real-world relevance.

Beyond cognitive engagement, the project also fostered social learning dynamics. Although executed individually, students engaged with peers through feedback sessions, exposure to peer videos, and social interaction on the TikTok platform. This aligns with Bandura's Social Learning Theory, where observation, modelling, and reinforcement play crucial roles in shaping learner behaviour. The public nature of TikTok provided a space for peer modelling, while algorithmic visibility and audience feedback offered external validation, enhancing motivation and performance [57].

Crucially, the approach also promoted the development of transversal competencies aligned with 21st-century learning goals. Students demonstrated critical thinking in interpreting and simplifying legal texts, digital literacy through video editing and platform use, and communication skills via scripting, voiceover narration, and visual storytelling. Furthermore, the iterative project structure reinforced soft skills such as time management, autonomy, and responsibility, which are essential competencies in professional practice [19].

Student satisfaction data corroborated these outcomes, indicating high levels of motivation, self-efficacy, and perceived learning. Learners expressed that the project encouraged self-directed learning and fostered a sense of empowerment and creative agency. Importantly, the role of social media engagement (e.g., likes, comments, shares) was perceived not merely as extrinsic feedback but as a motivational driver, affirming the value of their contributions and reinforcing intrinsic engagement.

The applicability of this strategy extends beyond OHS education. In STEM disciplines, where abstraction and procedural complexity often challenge traditional pedagogy, TikTok's short-video format offers an innovative medium for simplifying, visualizing, and communicating technical content. Students in chemistry, environmental science, physics, and engineering could employ similar approaches to document laboratory processes, simulate phenomena, or model systems, thereby enhancing science communication, a skill increasingly relevant in academic and professional contexts.

Additionally, the integration of storytelling, visual media, and narration enhances inclusive education by accommodating diverse cognitive styles and learning preferences. By bridging theoretical instruction with creative expression and practical application, this methodology fosters experiential learning and strengthens the relevance of academic content, particularly for adult or professional learners [19].

In conclusion, the integration of TikTok within a structured PBL framework represents a powerful pedagogical strategy for enhancing the learning of regulatory content and supporting competency development [29, 30]. Far from being a mere social media tool, TikTok, when intentionally embedded in educational design, facilitates constructivist, reflective and participatory learning. Its capacity to engage learners cognitively, socially, and emotionally positions it as a scalable and adaptable solution to the evolving demands of higher education in the digital age [2].

### ***3-9-Pedagogical and Methodological Limitations: Platform Familiarity and Digital Proficiency***

A key limitation of this study relates to the potential bias introduced by participants' prior familiarity with TikTok. While the platform was purposefully selected due to its popularity and alignment with students' digital communication preferences, pre-existing user comfort and positive attitudes toward TikTok may have influenced levels of engagement, motivation, and self-reported satisfaction. Although the observed variation in responses within the Perceived Ease of Use (PEU) and Perceived Usefulness of TikTok for Learning (PUTL) constructs suggests heterogeneity in digital proficiency, it remains difficult to fully disentangle platform familiarity from pedagogical impact.

Another methodological limitation stems from the absence of a baseline assessment of students' prior digital literacy or experience with alternative platforms such as YouTube, Instagram, or institutional Learning Management Systems (LMS). Without this initial stratification, it is challenging to isolate the specific influence of TikTok's platform features from students' general digital fluency. To address this gap, future studies should incorporate a pre-intervention survey to map students' digital backgrounds and competencies. Such profiling would enable more accurate interpretations of engagement patterns and learning outcomes across diverse learner subgroups.

Additionally, the study did not include a control group utilizing alternative media formats. While the primary objective was to explore TikTok's affordances within a Project-Based Learning (PBL) framework, a comparative design, featuring parallel tasks delivered via platforms such as YouTube or LMS, would have strengthened causal inferences regarding the platform's pedagogical value. This comparative dimension is essential for evaluating not just engagement, but also depth of learning, content retention, and professional skill transferability.

It is also worth noting that TikTok's popularity among younger demographics may have contributed to inflated motivation or affective responses, independent of the instructional content. As emphasized in contemporary literature, platform-driven engagement does not inherently translate into deep or durable learning unless embedded within a

rigorous instructional design. In this study, the integration of structured rubrics, instructor-guided scripting, and formative peer review mechanisms aimed to ensure that motivational effects were accompanied by cognitive development and conceptual accuracy. Nevertheless, future research should examine the long-term impact of such interventions through longitudinal tracking and mixed-methods approaches, including performance-based assessments and in-depth qualitative feedback.

From a constructivist pedagogical perspective, prior exposure to digital tools can be considered a mediating factor in learners' ability to recontextualize and internalize knowledge. However, the variability in digital skill levels also highlights the necessity of scaffolding, a core principle of constructivism, which ensures that all students, regardless of initial proficiency, are adequately supported in progressing toward independent mastery. Similarly, social learning theory underscores the role of digital familiarity in observational learning, peer modelling, and reciprocal feedback. These dynamics, while powerful, may advantage students with higher pre-existing competence in digital media, creating disparities that merit further investigation.

In summary, although this study provides strong evidence for the pedagogical viability of TikTok in regulatory education, its findings must be interpreted within the constraints of platform familiarity, participant digital heterogeneity, and the lack of cross-platform comparison. Addressing these limitations in future research will allow for a more nuanced understanding of how social media tools intersect with instructional design to support equitable, deep, and transferable learning in higher education.

## 4- Conclusion

This study demonstrates that integrating TikTok into a Project-Based Learning (PBL) framework offers a pedagogically robust approach to enhancing the teaching and internalization of Occupational Health and Safety (OHS) regulations in higher education. By engaging students in the creation of short-form videos based on Executive Decree 255, the intervention promoted active learning, critical thinking, and regulatory comprehension. The five-phase methodology, ranging from topic assignment and digital training to public dissemination and multidimensional evaluation, ensured structured engagement and meaningful content production. Rubric-based assessments and engagement analytics revealed high levels of student performance in content accuracy, creativity, and communication. Additionally, the validated questionnaire demonstrated strong internal consistency and construct validity, capturing significant improvements in motivation, perceived usefulness, and digital competence.

Beyond content mastery, the pedagogical value of this approach lies in its capacity to foster transversal skills essential for professional development, including communication, autonomy, and collaborative work. TikTok served not only as a creative learning medium but also as a real-world dissemination tool, allowing students to translate complex regulatory content into accessible formats for broader audiences. These outcomes align with constructivist and social learning theories, emphasizing active, contextualized knowledge construction through multimodal and collaborative tasks. This methodology presents a scalable, replicable strategy for other STEM disciplines that require the internalization of abstract or technical content. Although implemented in an online program, its design is inherently adaptable to face-to-face or hybrid learning environments, reinforcing its relevance across modalities. Future research should explore comparative studies across platforms and disciplines, as well as longitudinal analyses of knowledge retention and skill transfer. Overall, the project validates the integration of social media into structured pedagogical models as a powerful means to enrich regulatory education and advance competency-based learning in the digital age.

## 5- Declarations

### 5-1- Author Contributions

Conceptualization, D.G.; methodology, D.G.; software, D.L.L.; validation, D.G. and D.L.L.; formal analysis, D.G., D.L.L.; investigation, D.G. and D.L.L.; resources, D.G. and D.L.L.; data curation, D.L.L.; writing—original draft preparation, D.G. and D.L.L.; writing—review and editing, D.G.; visualization, D.G.; supervision, D.G. and D.L.L.; project administration, D.L.L.; funding acquisition, D.L.L. All authors have read and agreed to the published version of the manuscript.

### 5-2- Data Availability Statement

The data presented in this study are available on request from the corresponding author.

### 5-3- Funding and Acknowledgements

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#### 5-4- Institutional Review Board Statement

Our study involved undergraduate students as part of a formal academic project aimed at evaluating the educational effectiveness of Project-Based Learning (PBL) enhanced by social media. The project included surveys and instructor interviews, specifically focused on understanding student engagement, academic performance, and motivation, in line with standard pedagogical evaluation methods. As part of this educational research, no clinical, medical, or invasive procedures were conducted, and no sensitive personal data was collected. All participants provided informed consent to be involved in the study, and their responses were anonymized to maintain confidentiality. Additionally, the study was adhered to ethical guidelines established by the Universidad Técnica Particular de Loja to ensure that participants' rights and well-being were protected throughout the research process.

#### 5-5- Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

#### 5-6- Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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